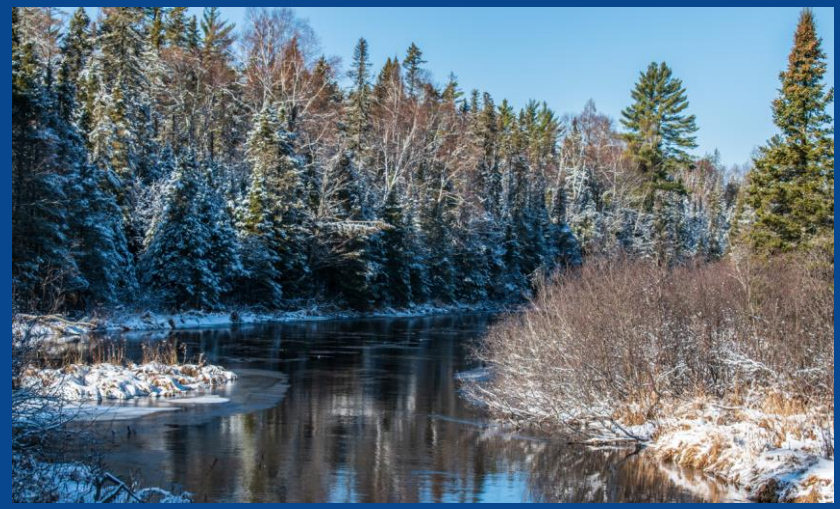
Statewide GIS 3DHP Hydrography Improvement Project



Mark Holmes, GISP
Geospatial Services Manager
Department of Technology, Management and Budget (DTMB)
Center for Shared Solutions (CSS)
holmesm3@michigan.gov

Webinar April 12, 2023

Background

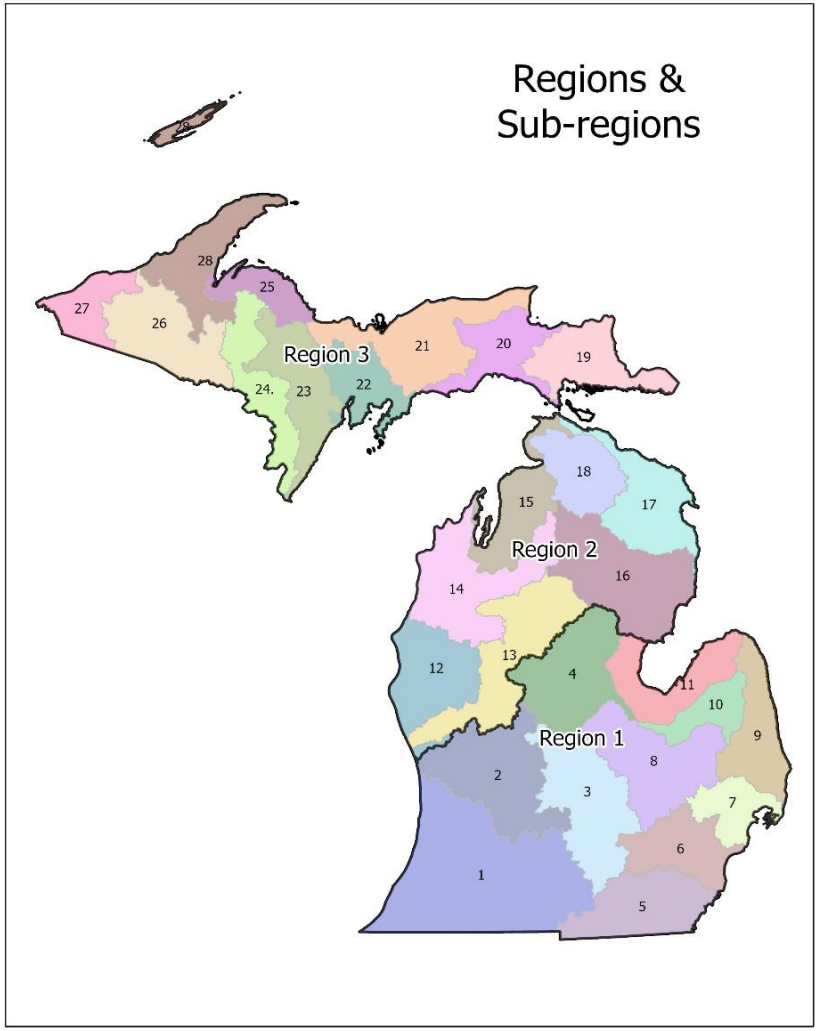
- State of Michigan Hydrography Focus Group formed in 2018 – multiple stakeholders from state government agencies
- Leverage statewide QL2 LiDAR to improve positionally accuracy of hydrography
- DTMB Center for Shared Solutions coordinating project that started in October 2021
- Four to five year project
- State advisory group in place for project (EGLE, DNR, DTMB, MDOT, MDARD)
- State of Michigan team and vendor coordinating with USGS to align all work with USGS 3DHP standards and specifications

Hydrography GIS Data Improvement Project

Local Governments

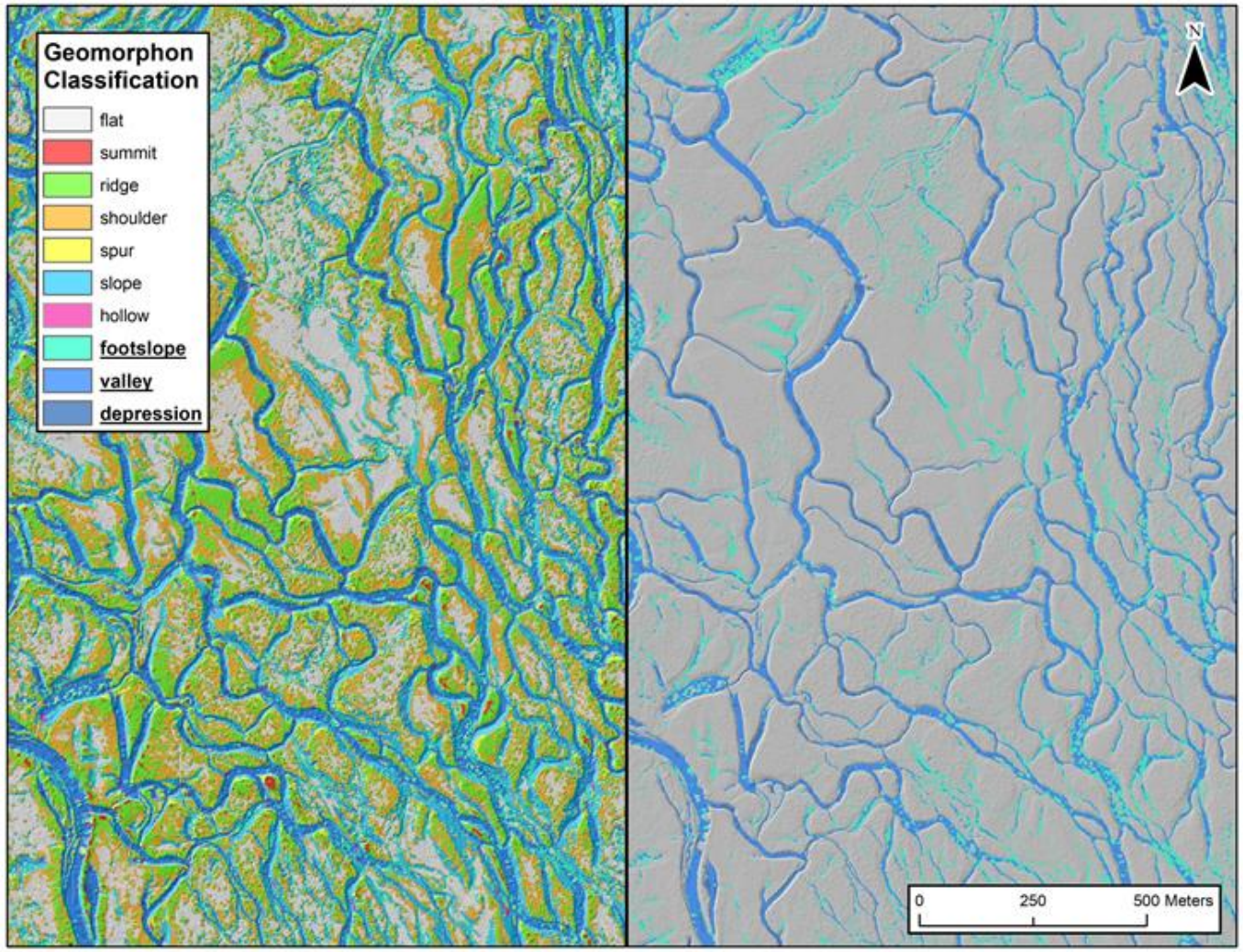
Hydrography Data Improvement Project Objective

Produce elevation-derived 3D hydrography datasets and refined watershed boundary data from existing lidar data across the state of Michigan according to new USGS 3DHP specifications.



Hydrography Data Improvement Process

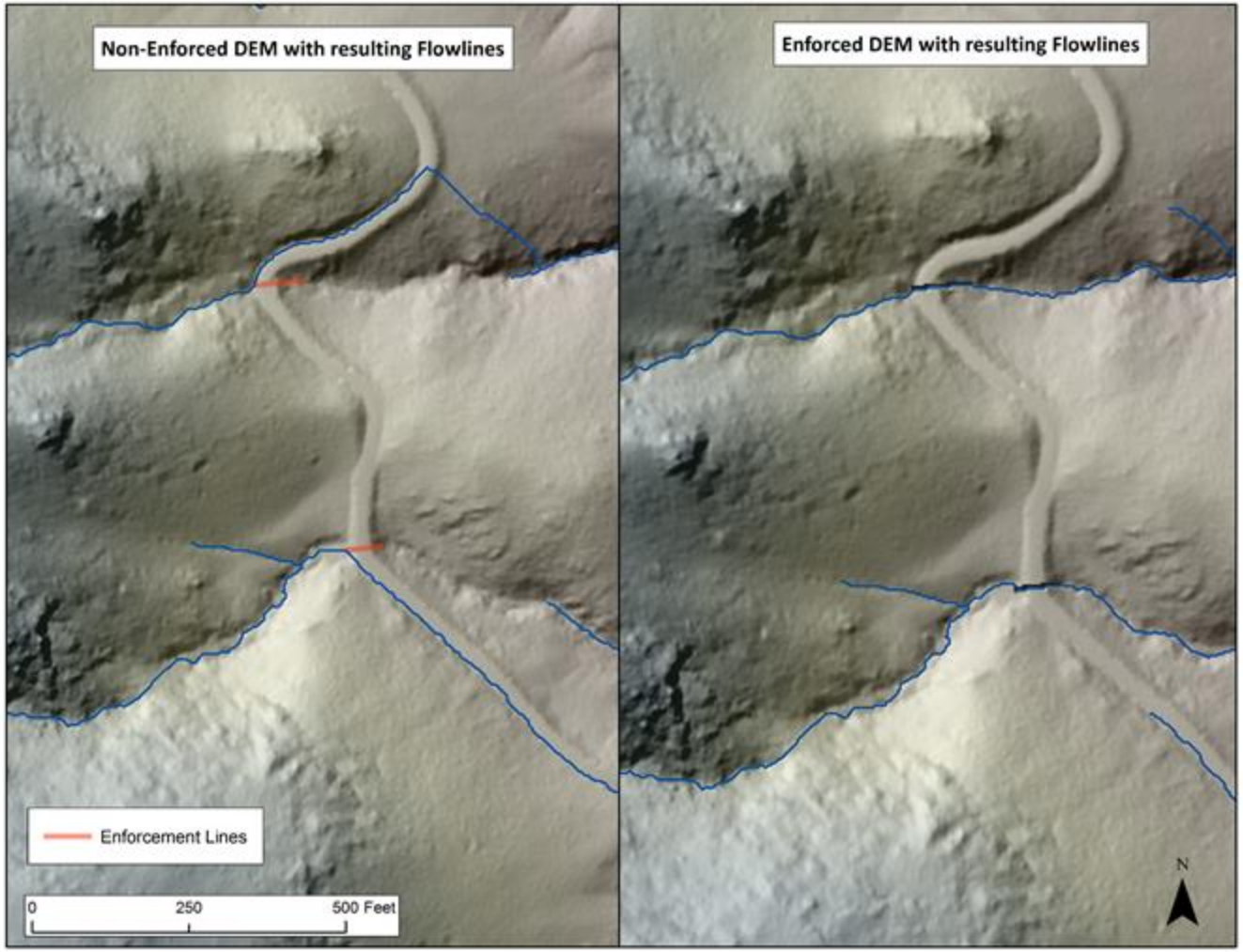
- DEM Filtering
- Geomorphon Classification
- Topographic Openness
- Black Top Hat
- Curvature
- Sinks



Hydro-Enforcement

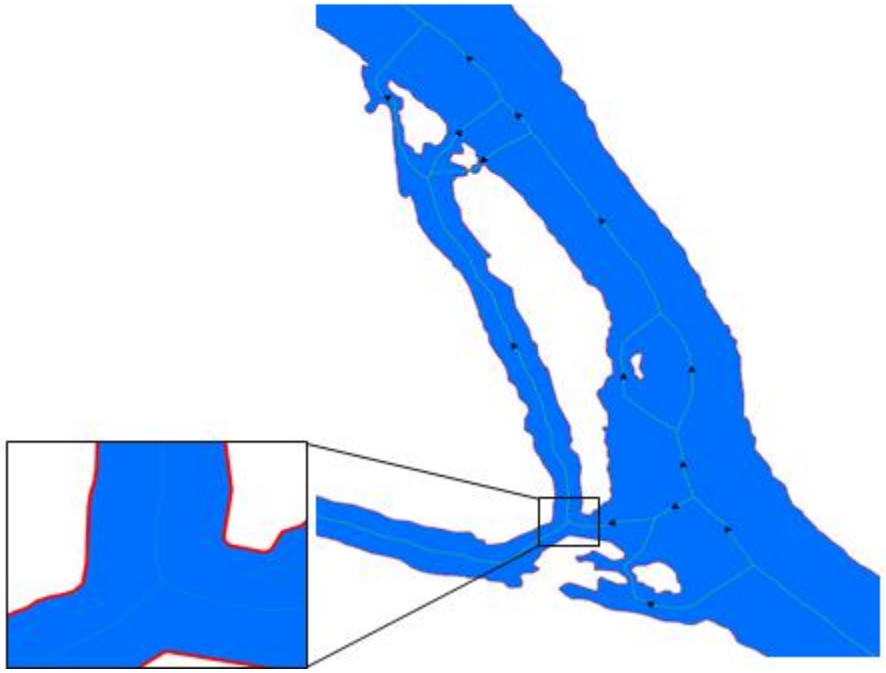
- Iterative process to remove false obstruction to flow.
- Enforce known culverts
- Identify unmapped road crossings
- Evaluate sinks and GMs for channel signatures.

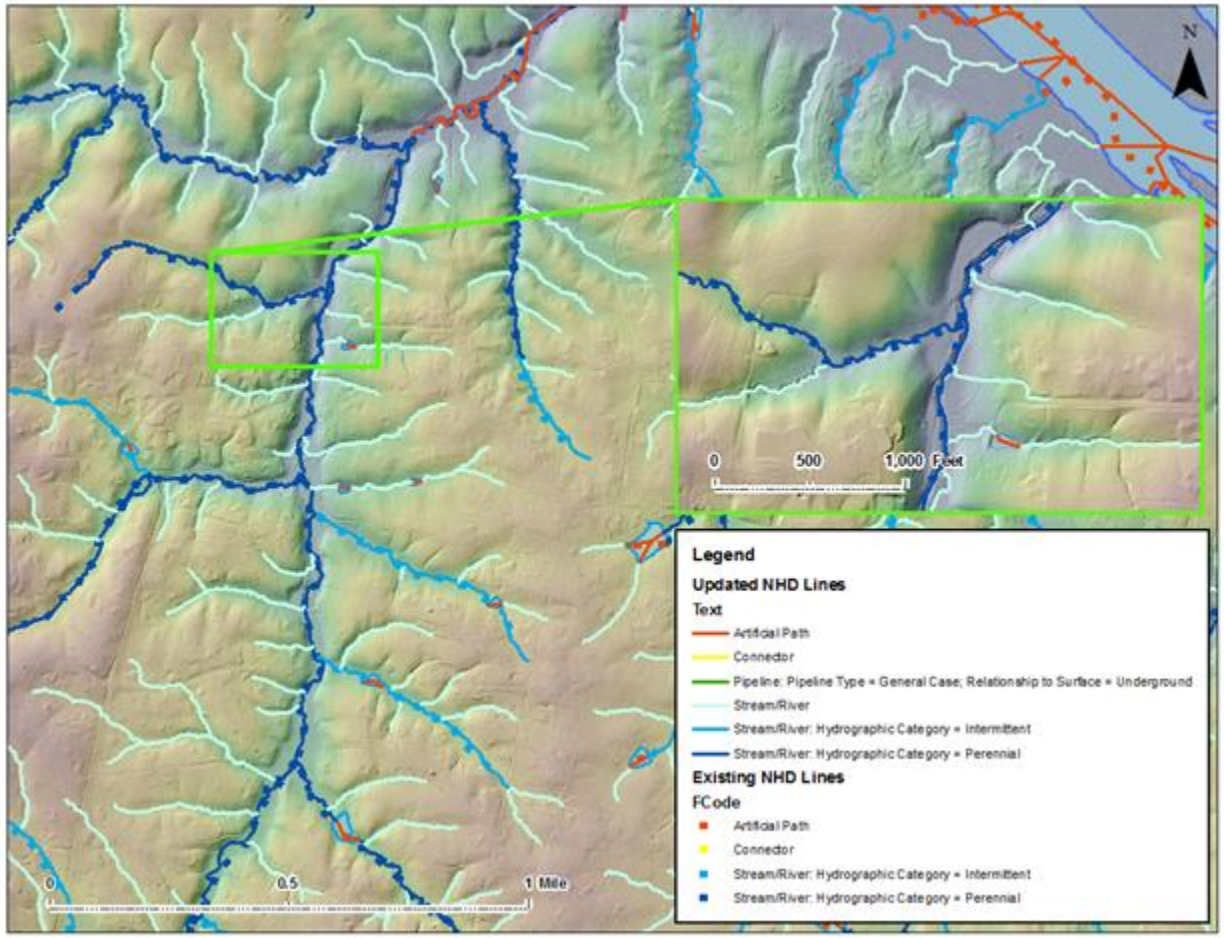
- **Each enforcement will be classified as culvert (including "false" culverts)**



Generate Hydro Networks

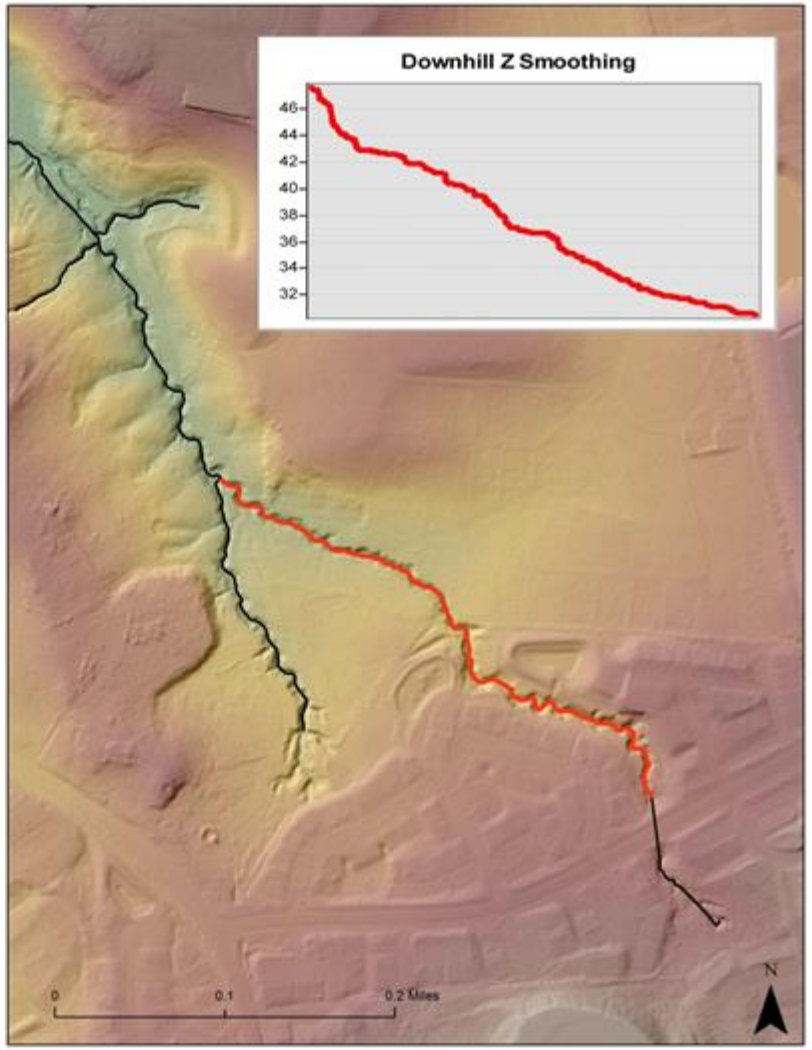
- Generate artificial flow paths
- Integrate all features
- Ensures correct feature classification and topology





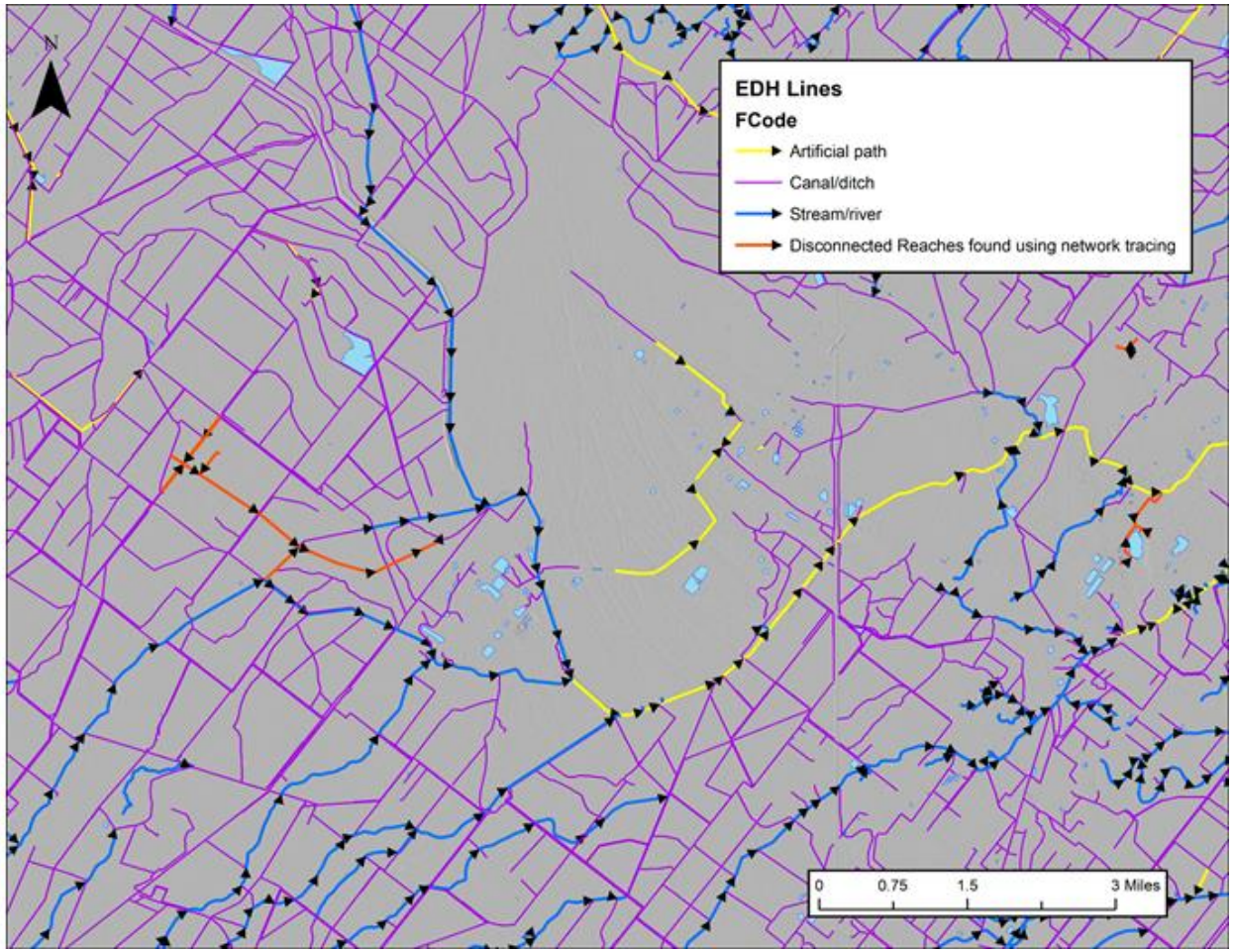
Assign Z Values and Montonicity

- Extract values from lidar data
- Enforce downstream flow and line direction for all single flowlines/double line streams
- Assign single elevation for all lakes and reservoirs
- Ensure downstream flow and agreement propagated through entire network



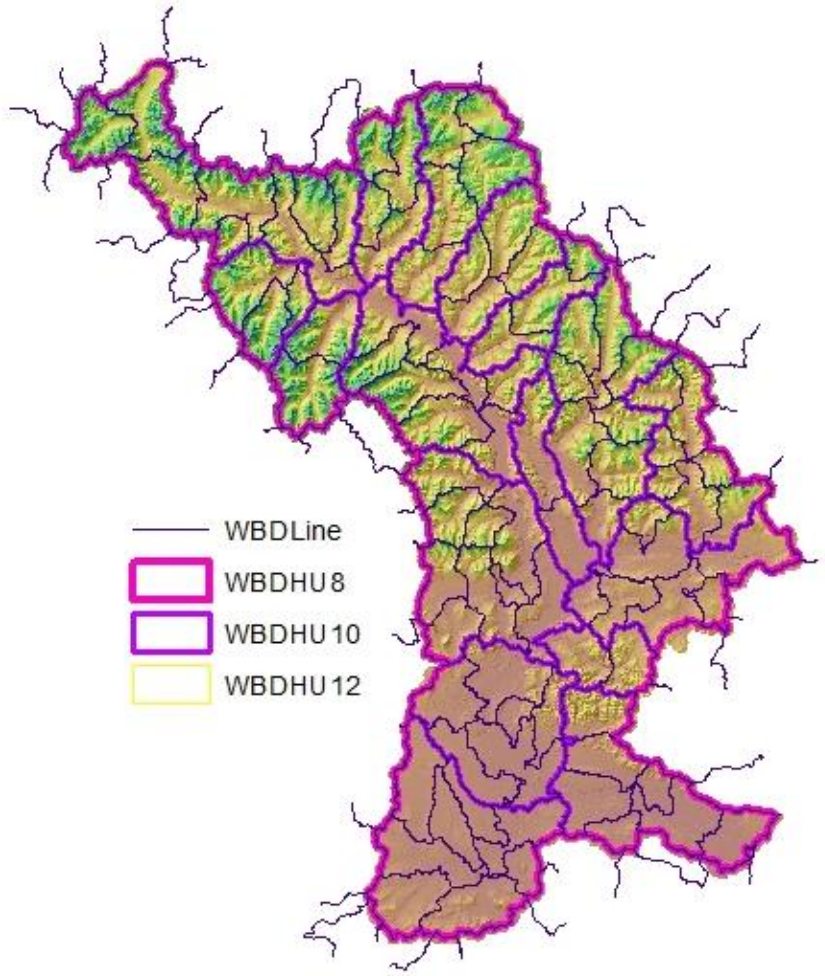
METHODS – *QUALITY CONTROL OF NETWORK*

- QC inherent in data development process.
- Final checks include
  - Geometric network tracing
  - Transect base alignment
  - Node agreement
  - Vertex spacing
  - Classification
    - Artificial paths
    - Culverts
    - Seasonality (from prior or local review)

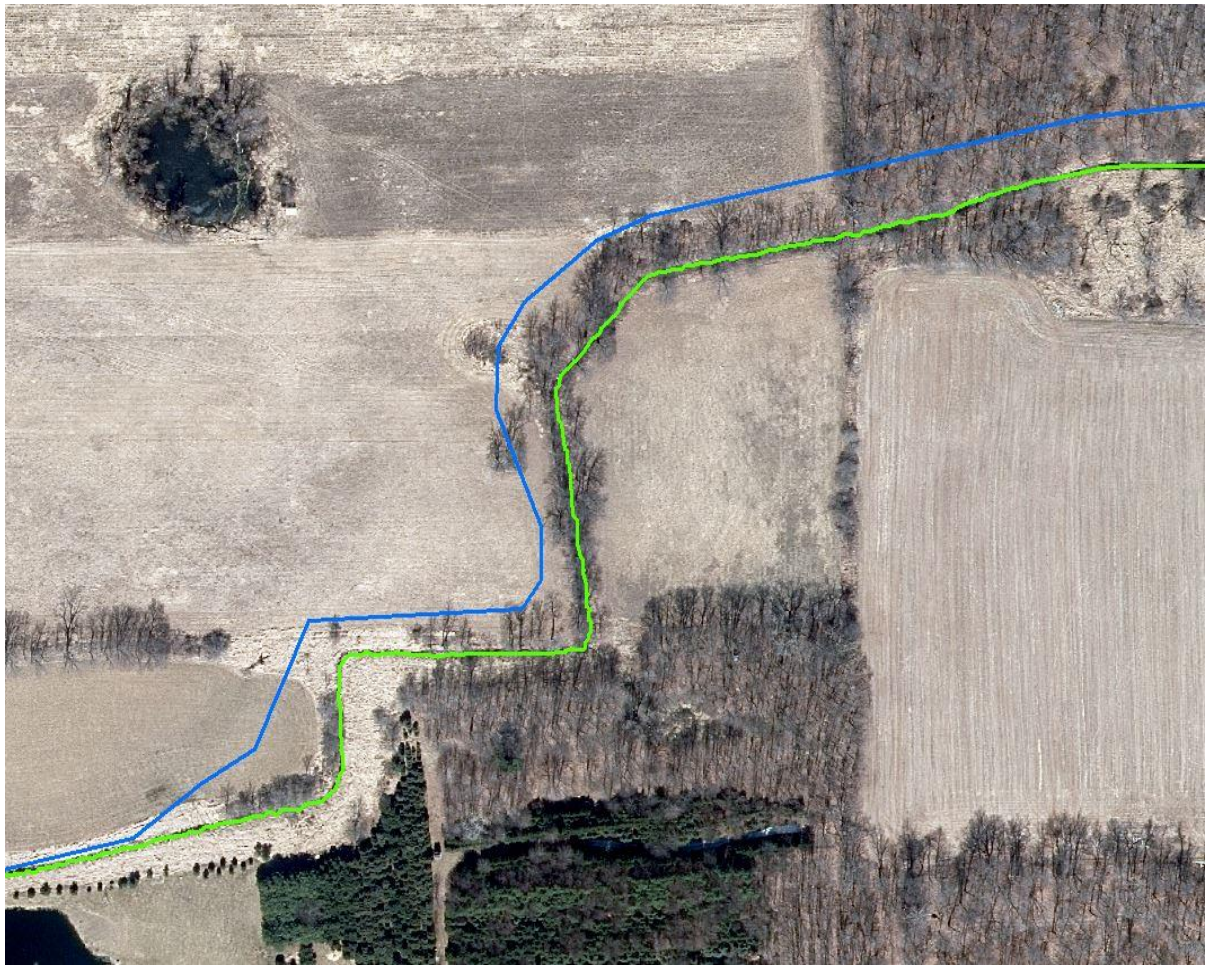


Watershed Boundary Delineation

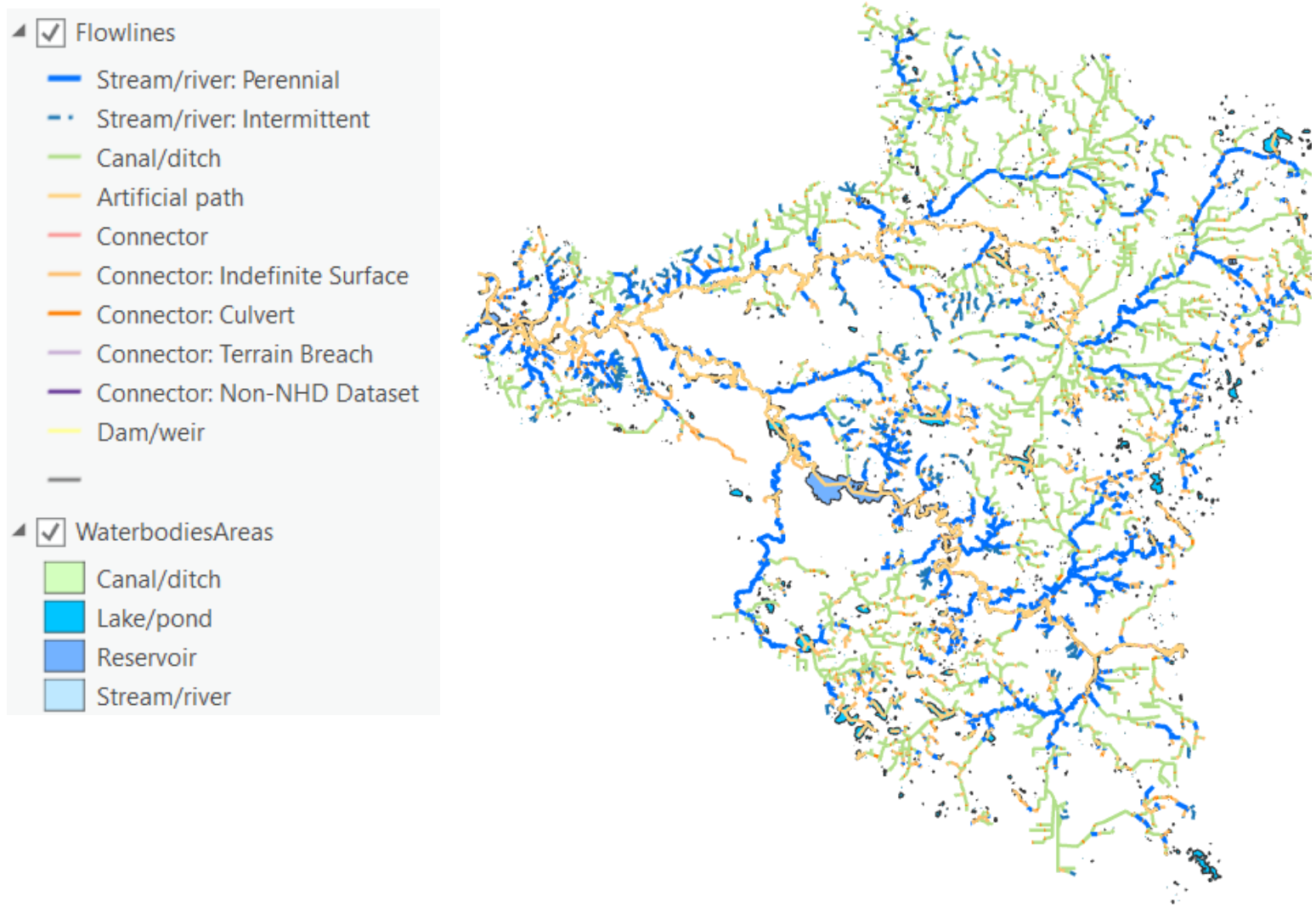
- Update WBD hydrologic units (HU) for the AOI based on source elevation data and 3DHP derivatives
  - NV5G Shall Refer to:
    - **Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD)** as guidance for delineation, coding, and naming specifications

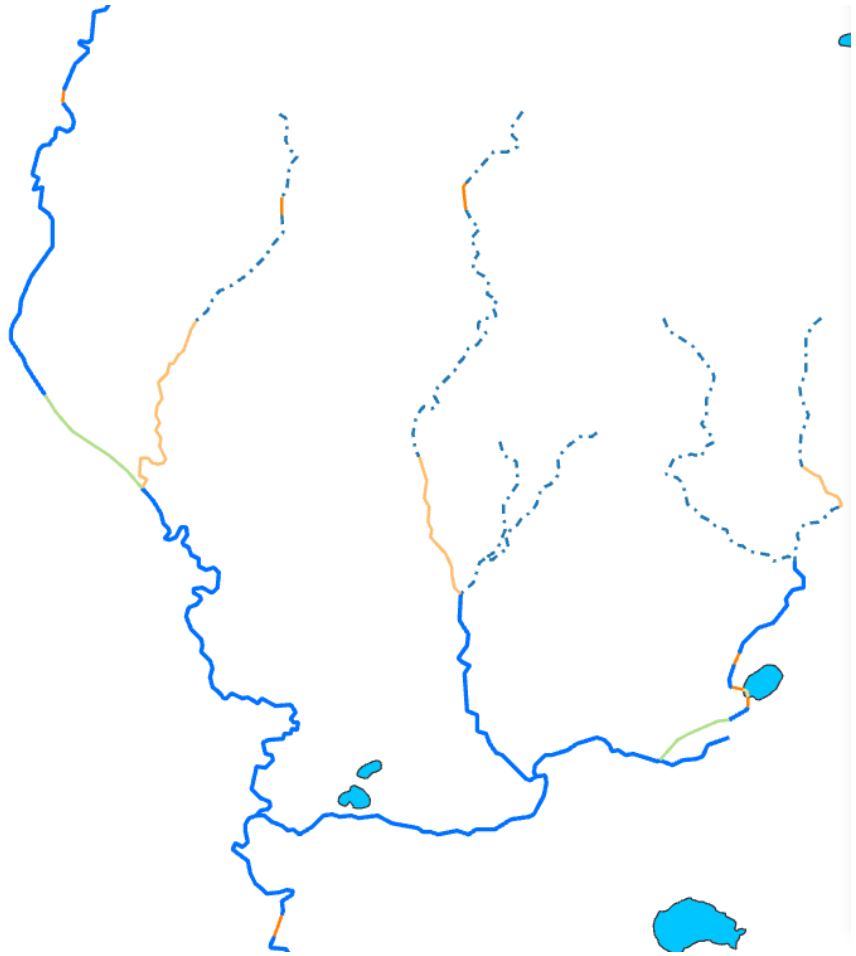


Hydrography Data Improvement – Positional Accuracy

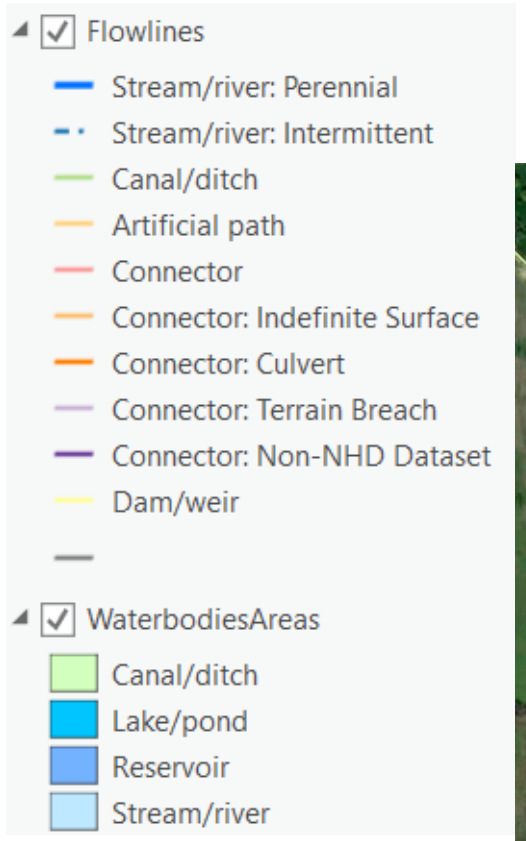


New Hydrography Data Adhering to USGS Elevation Derived Hydrography Specifications





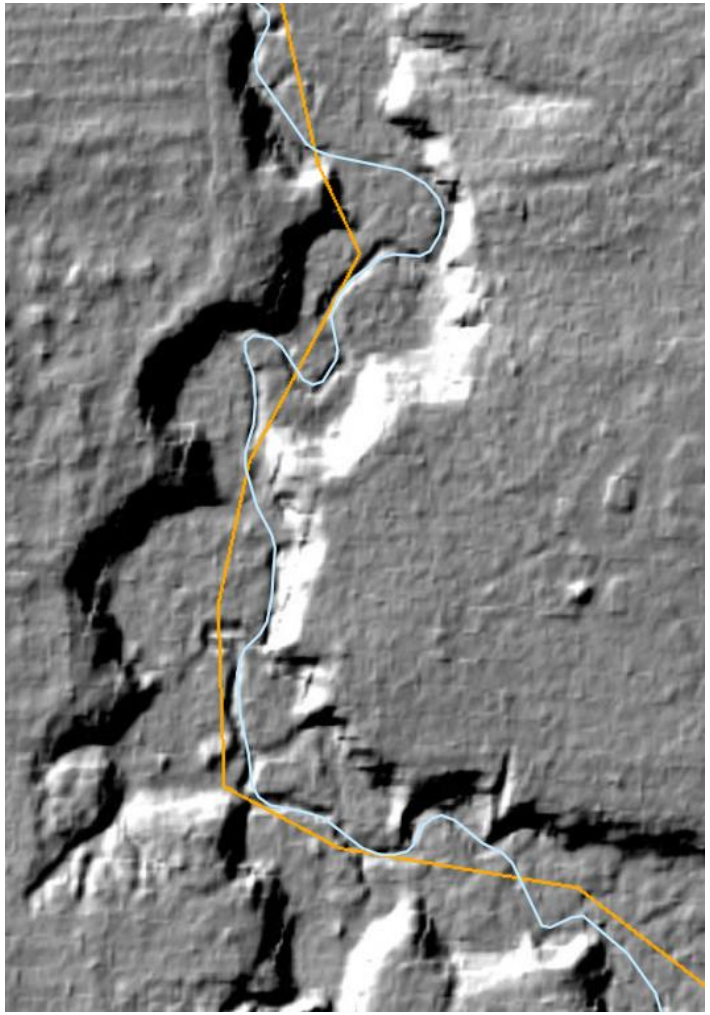
Hydrography Data Improvement – Additional Flowlines Collected



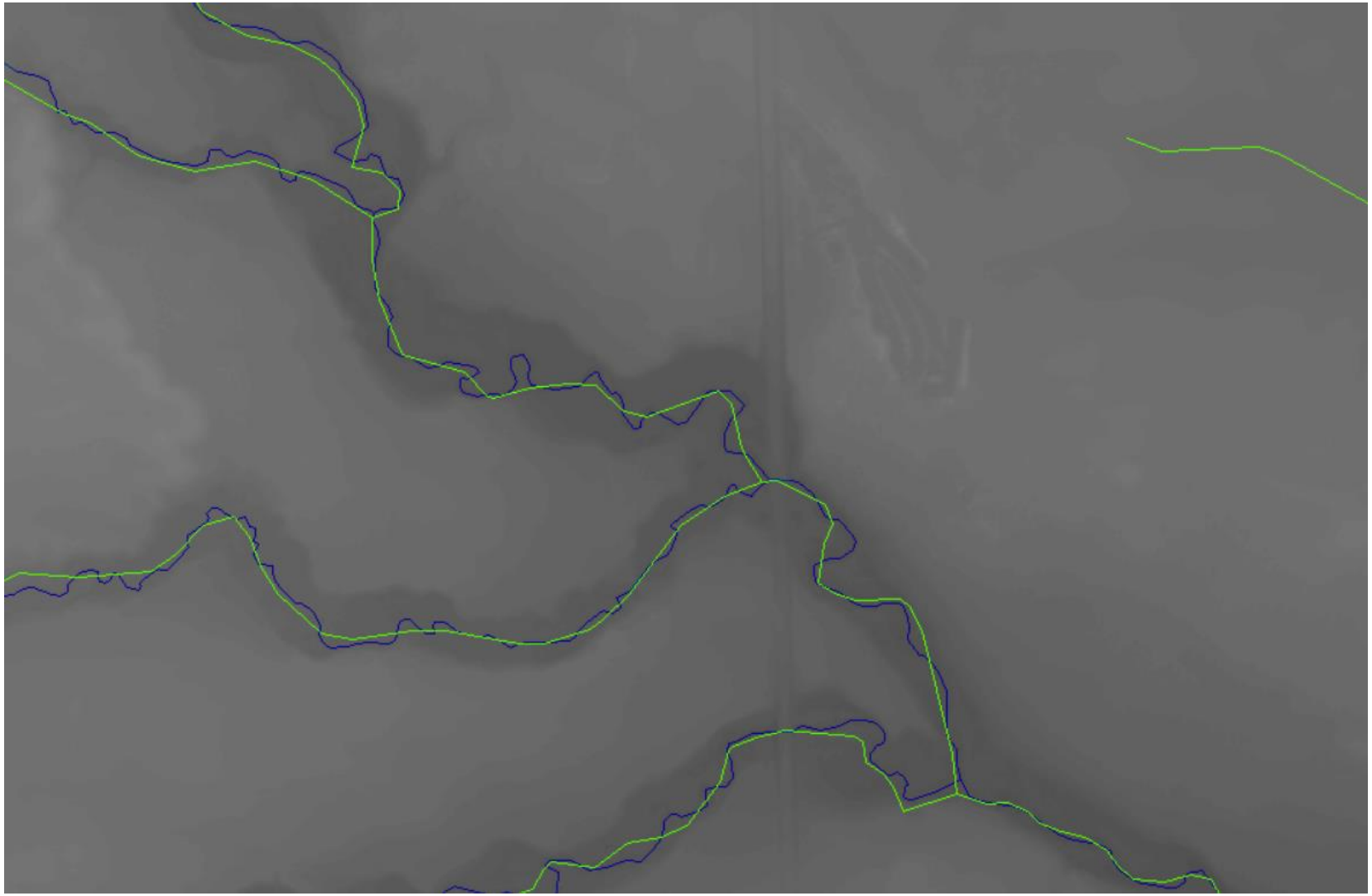
USGS NHD Specifications-Based Flowlines

Additional EDH Specification Flowlines

Hydrography Data Improvement – Improved Accuracy



Hydrography Mapping Examples (2)



Hydrography Mapping Examples (2)

Hydrography Data Improvement – Culvert Connectors

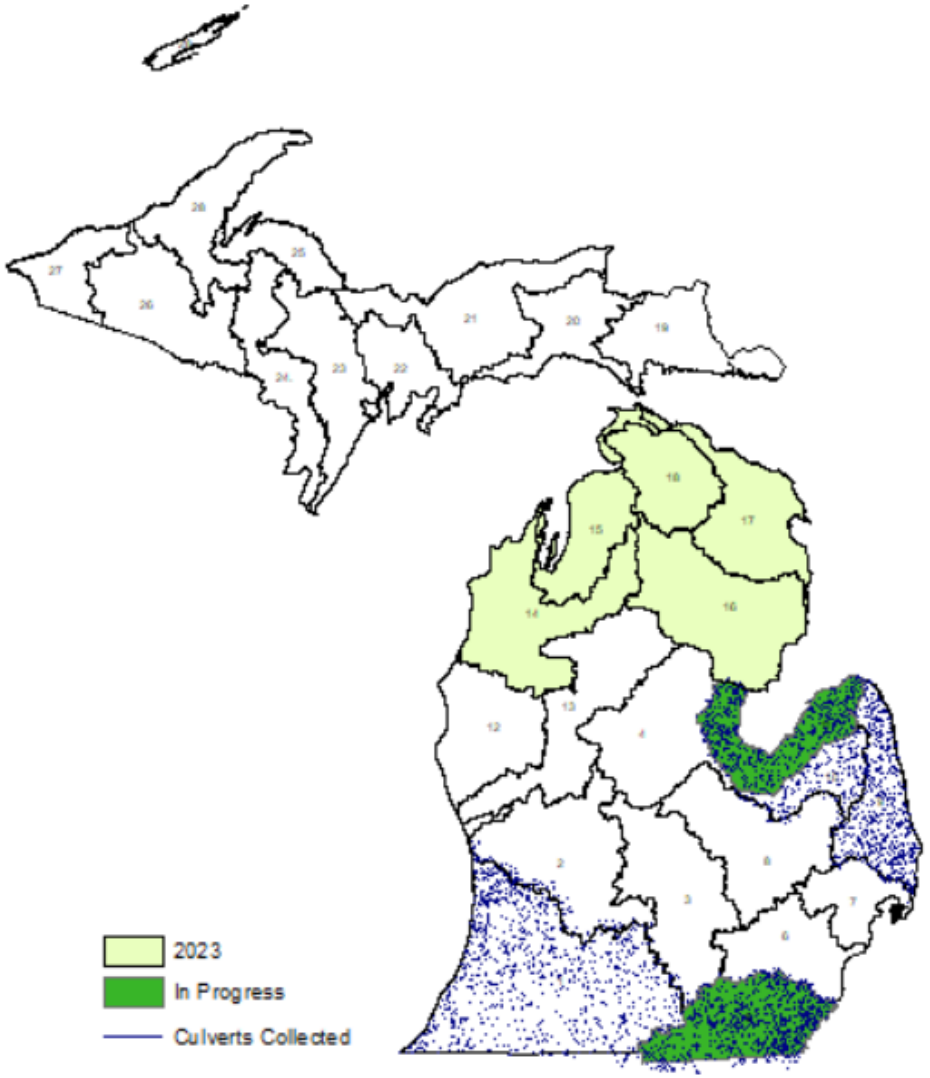
Need for Culverts to Generate Flowlines

Original DEM

New Flowlines and Culverts

New Hydro-enforced DEM

Project Regional Map – Current Status



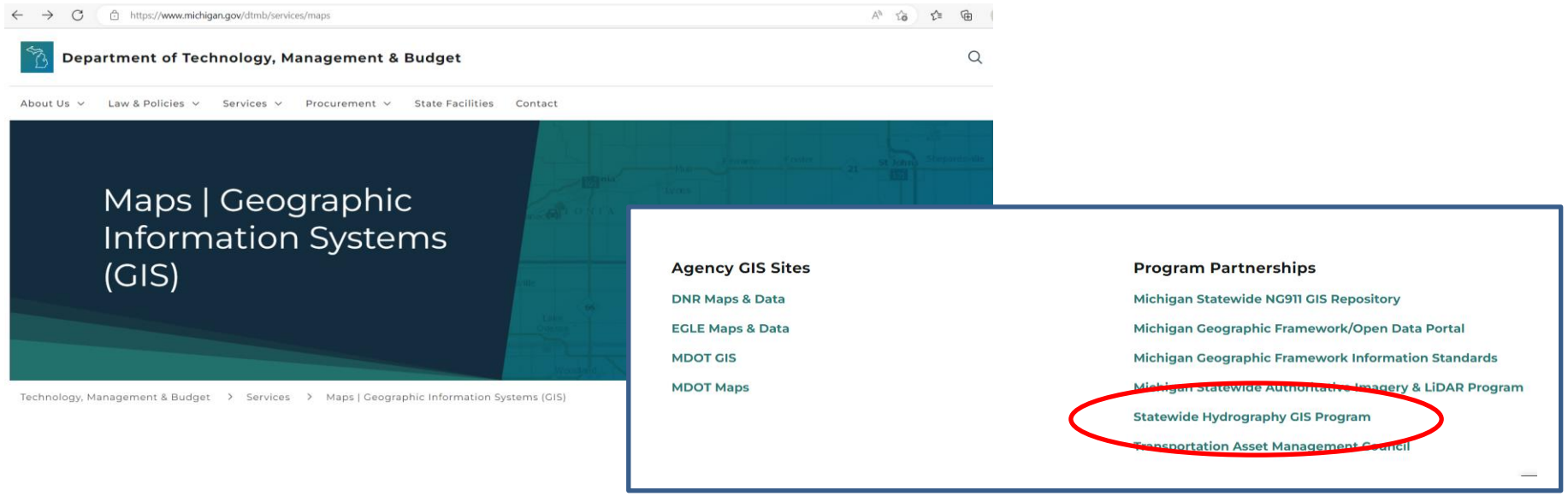
Hydrography Data Project – Programs Benefitting

Emergency Management	Fish Stocking	Minerals	Real Estate	Nutrient Load Modeling
Parks and Recreation	Habitat Management	Invasive Species	Natural Rivers Program	Charter Fishing Program
Forest Inventory	Conservation Enforcement	Wetland Protection	Hydrologic Modeling	Wildlife Management
Fire Management	Oil and Gas Mining	Hydrologic Studies	Floodplain Program	Endangered Species
Watershed Delineations	Geologic Mapping	Containment Investigations	Coastal Management	Water Table Mapping
Navigation	Tourism	Environmental Assessments	Cartography	Asset Management

Project Support Web Page

Information and Help

- **Program website**: http://www.michigan.gov/gis



State of Michigan Hydrography Stewardship

- Long-Term Data Maintenance Plan
  - Part of hydrography project scope:
    - Set up feedback loop for edits
    - New USGS 3DHP data portal and tools will most likely part of workflow
    - Stakeholder input from across state
    - Data steward is liaison with the USGS, SOM Hydrography Advisory Committee.
    - CSS staff and any other authorized editors will update and maintain hydro data in Framework and for Michigan in USGS.
    - Will be authorized editors for specific geometry and attributes
    - Initial maintenance workflows probably not until 2025

Tim Lauxmann, DTMB GeoData Manager
Michigan Hydrography Data Steward
lauxmannt@michigan.gov
517-898-5663

Local GIS Source Data to Improve Hydrography Network

- Request for following GIS data sets
  - Culvert locations
  - Drains or drainage ways
  - Existing hydrography data (rivers, lake, streams, water bodies)

- How to provide GIS data to DTMB

  - Contact Ulrika Zay at zayu@michigan.gov

  - You will get a dedicated OneDrive folder for your data upload

  - When your region is done we will provide any additional data created back to you

  - This additional data will help to connect the stream networks and make the best GIS data product possible for your geographic area

Questions